

US006321793B1

(12) United States Patent

Czaplicki et al.

(10) Patent No.:

US 6,321,793 B1

(45) Date of Patent:

Nov. 27, 2001

(54)	BLADDER SYSTEM FOR REINFORCING A
` '	PORTION OF A LONGITUDINAL
	STRUCTURE

(75) Inventors: Michael J. Czaplicki, Rochester;

Thomas L. Coon, Lapeer, both of MI

(US)

(73) Assignee: L&L Products, Romeo, MI (US)

(*) Notice: Subject to any disclaimer, the term of this

patent is extended or adjusted under 35

U.S.C. 154(b) by 0 days.

(21) Appl. No.: 09/591,877

(22) Filed: Jun. 12, 2000

(51) Int. Cl.⁷ F16L 55/12 (52) U.S. Cl. 138/93; 138/172; 138/89

(56) References Cited

U.S. PATENT DOCUMENTS

0.0.11112.11					
1,814,677	٠	7/1931	Fennema 138/93		
3,054,636		9/1962	Wessells, III .		
3,123,170		3/1964	Bryant .		
3,493,257		2/1970	Fitzgerald et al		
3,665,968		5/1972	DePutter.		
3,746,387		7/1973	Schwenk.		
3,757,559		9/1973	Welsh.		
3,890,108		6/1975	Welsh.		
4,019,301		4/1977	Fox.		
4,029,128	*	6/1977	Yamagishi 138/93 X		
4,082,825		4/1978	Puterbaugh .		
4,083,384	+	4/1978	Horne et al 138/93		
4,090,734		5/1978	Inami et al		
4,238,540		12/1980	Yates et al		

(List continued on next page.)

FOREIGN PATENT DOCUMENTS

2919046 5/1979 (DE). G9011147.8 9/1990 (DE).

4028895C1	2/1992	(DE).
G9320333.0	6/1994	(DE) .
19858903A1	6/2000	(DE).
82102135.9	3/1982	(EP) .
90202150.0	8/1990	(EP) .
91104546.6	3/1991	(EP).
94101343.5	1/1994	(EP) .
95913082.4	3/1995	(EP) .
0 891 918 A1	1/1999	(EP) .
0 893 331 A1	1/1999	(EP).
0 893 332 A1	1/1999	(EP) .
2749263A1	5/1996	(FR).
628863	3/1947	(GB).
8028960	9/1980	(GB).
8725028	10/1987	(GB).
61118211	6/1986	(JP) .
64-69308	3/1989	(JP) .

(List continued on next page.)

OTHER PUBLICATIONS

PCT WO 99/08854 Harrison et al. Publication Date Feb. 25, 1999.*

PCT WO 00/13958 Wycech, Publication Date Mar. 16, 2000.*

PCT WO 99/61289 Wycech, Publication Date Dec. 2, 1999.*

PCT WO 00/41916 Wycech, Publication Date Jul. 20, 2000.*

Primary Examiner—Patrick Brinson

(74) Attorney, Agent, or Firm-Dobrusin & Thennisch PC

(57) ABSTRACT

A bladder system and method for reinforcing at least a portion of a structural member, including a flexible barrier member for dividing at least a portion of the structural member being reinforced into one or more sections; and a reinforcement material for filling one or more sections bounded by the flexible barrier member. The reinforcement material filling one or more sections of the structural member can be a pumpable polymeric material, and the flexible barrier member can be a polymeric material.

22 Claims, 2 Drawing Sheets

